

Basics of VLSI
B.E. Sem. VIII [BIOM]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Oral Exam	–	25
Term Work	–	25

SYLLABUS

- 1. Introduction to VHDL hardware description language**
Core features of VHDL, data types, concurrent and sequential statements, data flow, behavioral, structural architecture. Architecture of Xilinx XC4000 FPGA family, Xilinx XC 9500 CPLD's family.
- 2. Combinational and Sequential Logic design using VHDL**
Using VHDL combinational circuit design examples- multipliers, decoders and encoders, barrel shifter, simple floating point encoder, cascading comparator. VHDL sequential circuit design features. Implementation of counters and registers in VHDL.
- 3. Very Large Scale Integration (VLSI) Technology**
Physics of NMOS, PMOS, enhancement and depletion mode transistor, MOSFET, threshold voltage, flatband condition, linear and saturated operation, FET capacitance, short channel and hot electron effect.
- 4. MOS Transistors**
MOS transistor switches, Basic MOS inverter and its working, types of MOS invertors viz active load nMOS inverter, MOSFET Inverter with E-nMOS as pull up, MOSFET Inverter with D-nMOS as pull up, MOSFET Inverter with pMOS as pull up, Parameter measurement in MOS circuits viz voltage transfer characteristics, noise immunity and noise margins, power and area considerations.
- 5. Silicon Semiconductor Technology**
Wafer processing, mask generation, oxidation, epitaxy growth diffusion, ion implantation, lithography, etching, metalization, basic NMOS and PMOS processes. Latch up in CMOS and CMOS using twin tub process. Scaling of MOS circuits, types of scaling and limitations of scaling.
- 6. Design rules and Layout**
NMOS and CMOS design rules and layout, Design of NMOS and CMOS inverters, NAND and NOR gates. Interlayer contacts, butting and buried contacts, stick diagrams, layout of inverter, NAND and NOR gates.
- 7. Design of basic VLSI circuits**
Design of circuits like multiplexer, decoder, priority encoder, Flip flops, shift registers using MOS circuits.

References Books :

1. Introduction to VLSI design, (*E. D. Fabricus*) McGraw Hill Publications, first edition, 1990
2. Basic VLSI Design (*D.A. Pucknell and Eshraghian*)
3. Digital Design Principles and Practises (*John F Wakerly*)
4. VHDL Programming by Examples (*Douglas Perry*) Tata McGraw Hill Publications, 2002
5. CMOS Digital Integrated Circuits (*Kang*) Tata McGraw Hill Publications
6. Principles of CMOS VLSI Design : (*Neil H.E. Weste, Kamran Eshraghian*) A Systems Perspective second edition, Addison Wesley Publications, 1993
7. Digital Integrated Circuits : A Design Perspective (*Rabaey Jan M., Chandrakasan Anantha, Nikolic Borivoje*) second edition, Prentice Hall of India
8. Introduction to VLSI circuits and systems (*John P Uyemura*) John Wiley & Sons
9. Circuit Design with VHDL (*Volnei A. Pedroni*) Prentice Hall of India

